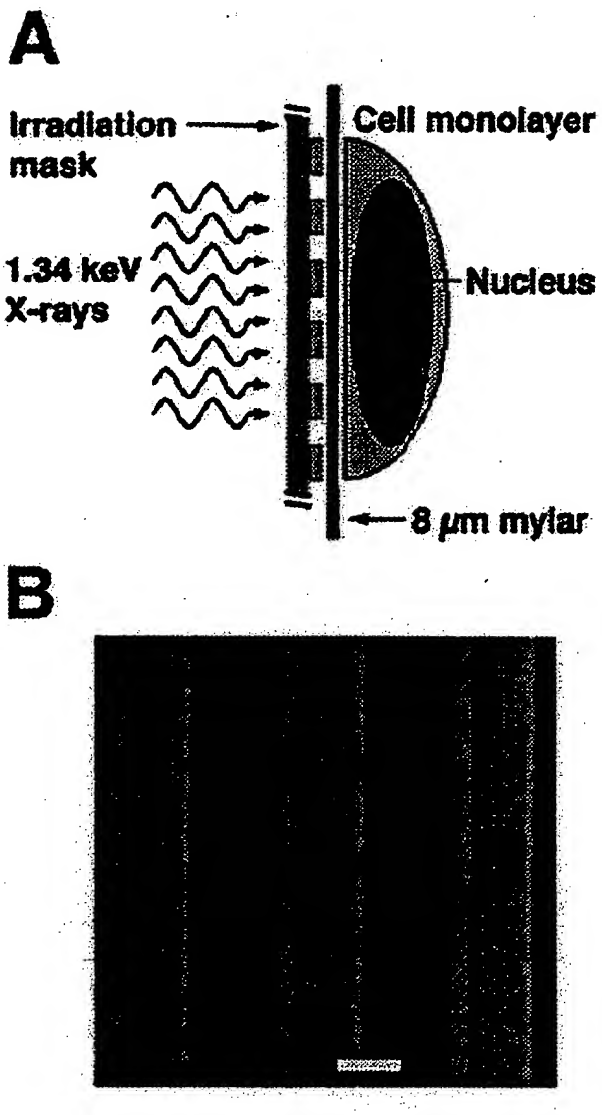
A
Irradiation mask
Cell monolayer
1.34 keV X-rays
Nucleus
8 μm mylar
B

FIG. 1

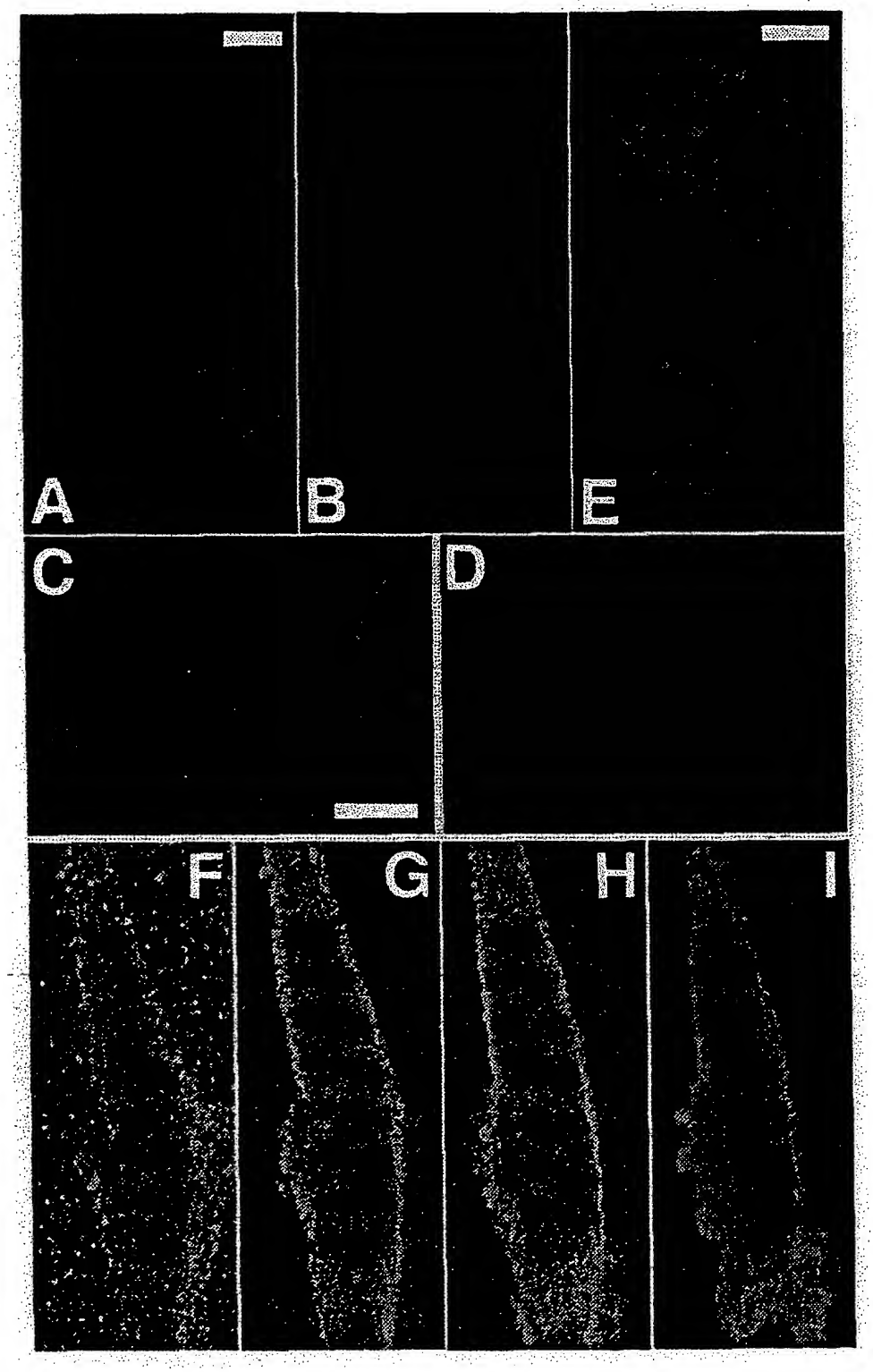

FIG. 2

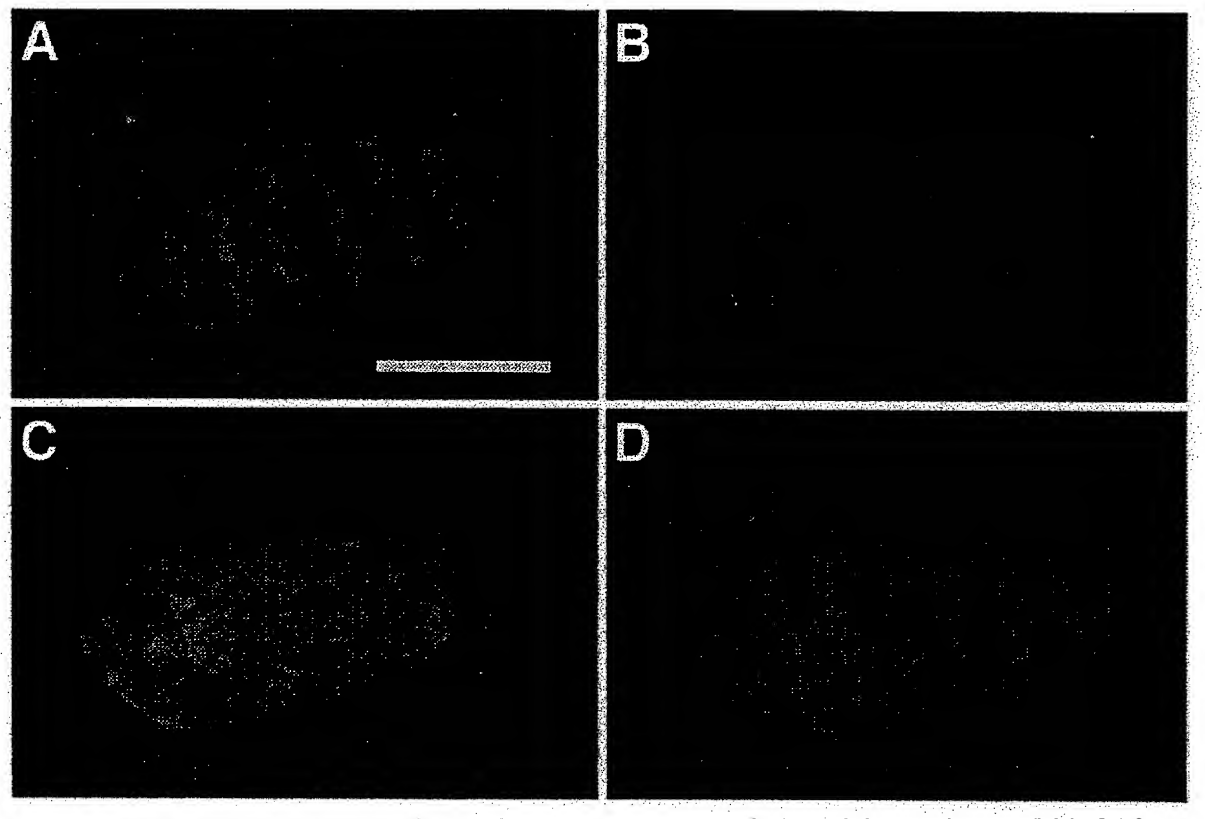

FIG. 3

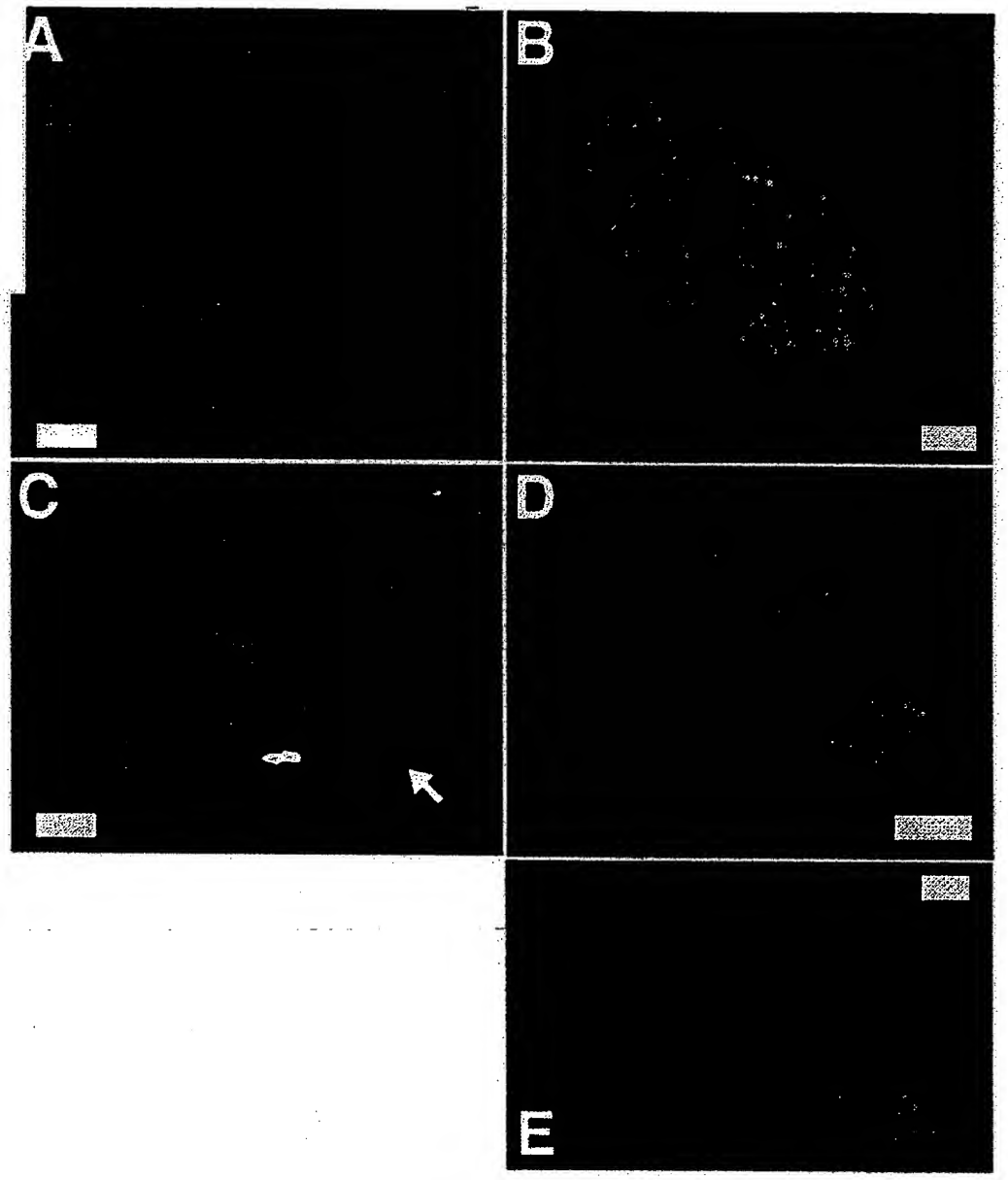

FIG. 4

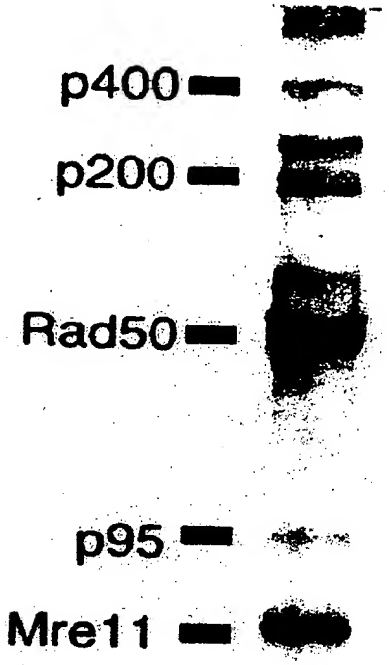
p400
p200
Rad50
p95
Mre11

FIG. 5


A
1
4483 bp
1
754 aa
B
p95
xrs2
p95
xrs2
p95
xrs2
C
1 2 3 4 5 6 7 8 9
23.9
9.4
6.7
4.4

FIG. 6

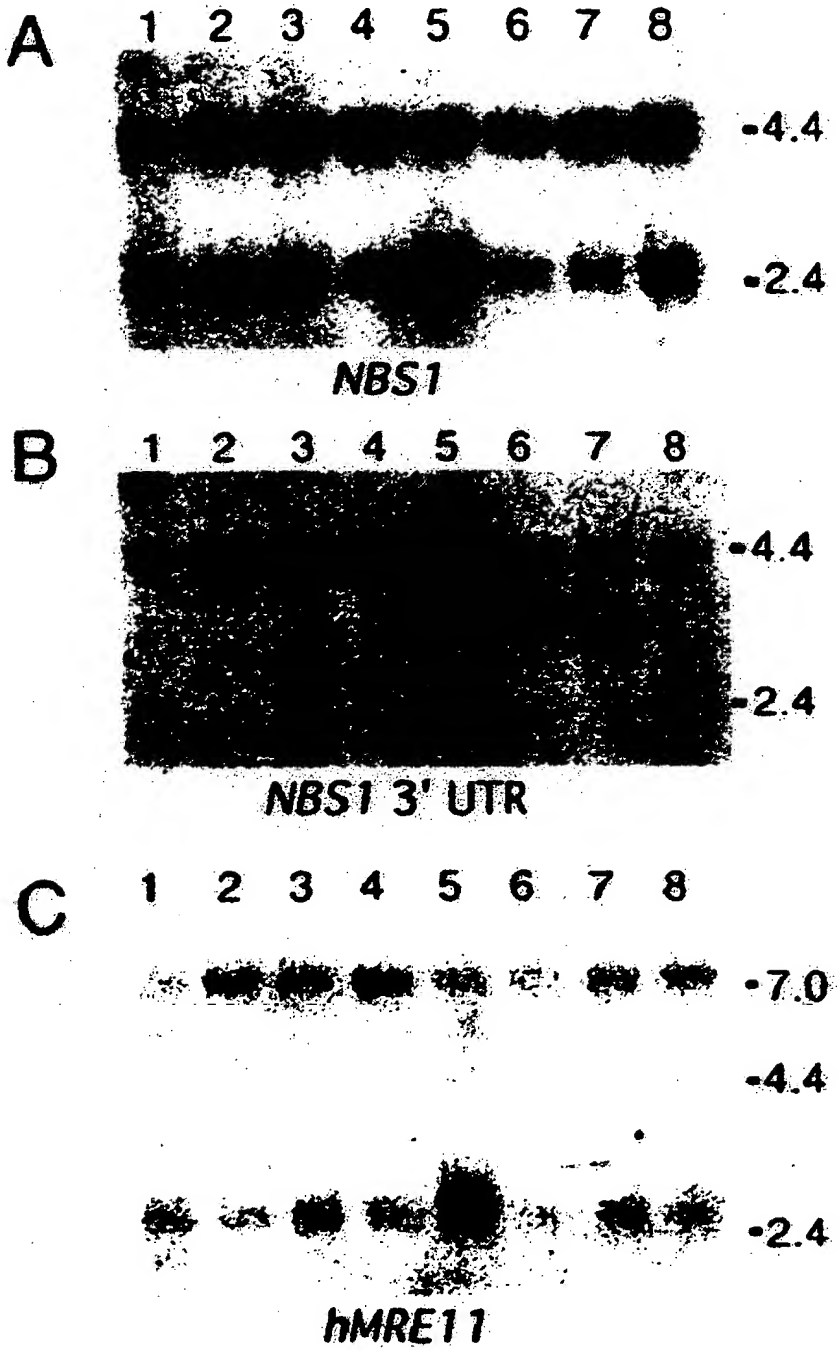
A
1 2 3 4 5 6 7 8
-4.4
-2.4
NBS1
B
1 2 3 4 5 6 7 8
-4.4
-2.4
NBS1 3' UTR
C
1 2 3 4 5 6 7 8
-7.0
-4.4
-2.4
hMRE11

FIG. 7

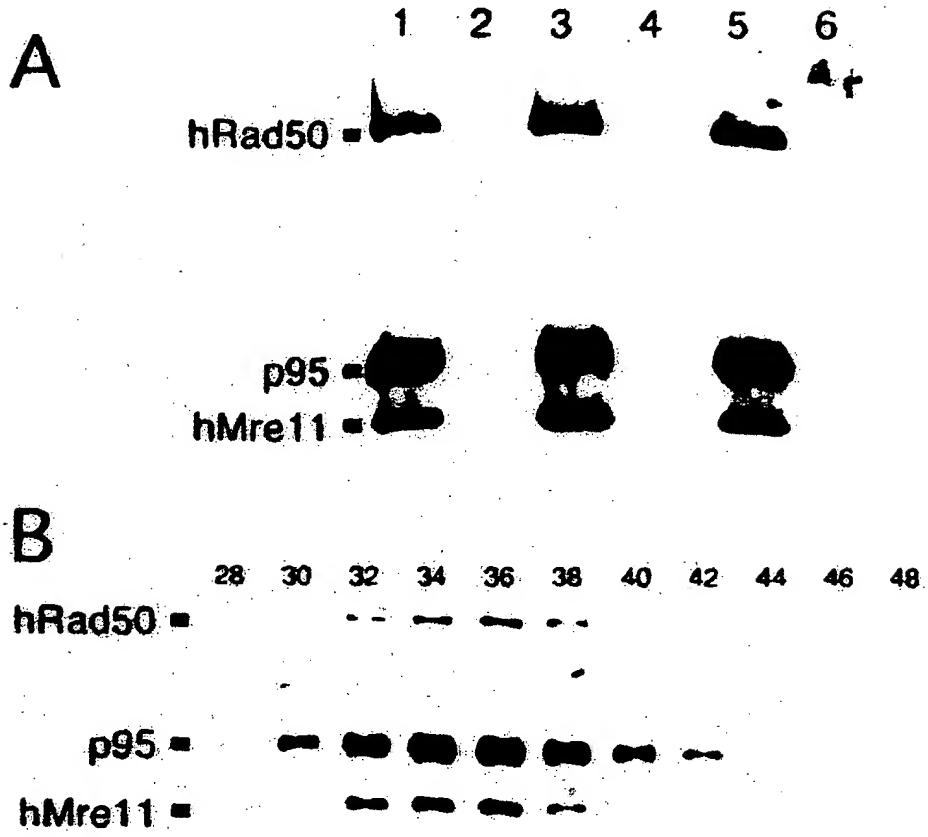
A
1 2 3 4 5 6
4+
hRad50
p95
hMre11
B
28 30 32 34 36 38 40 42 44 46 48
hRad50
p95
hMre11

FIG. 8

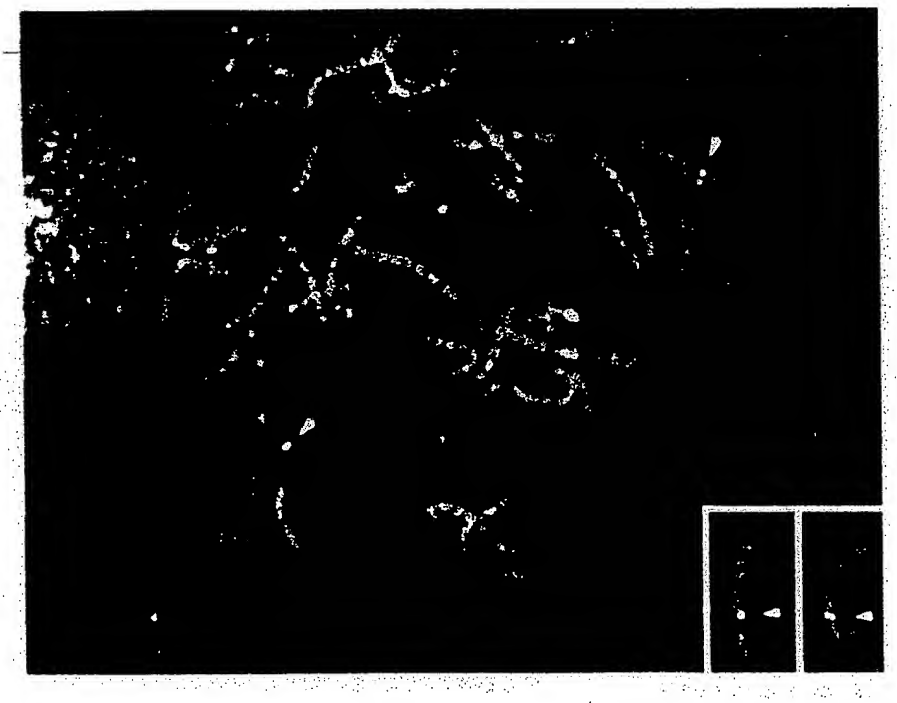

FIG. 9

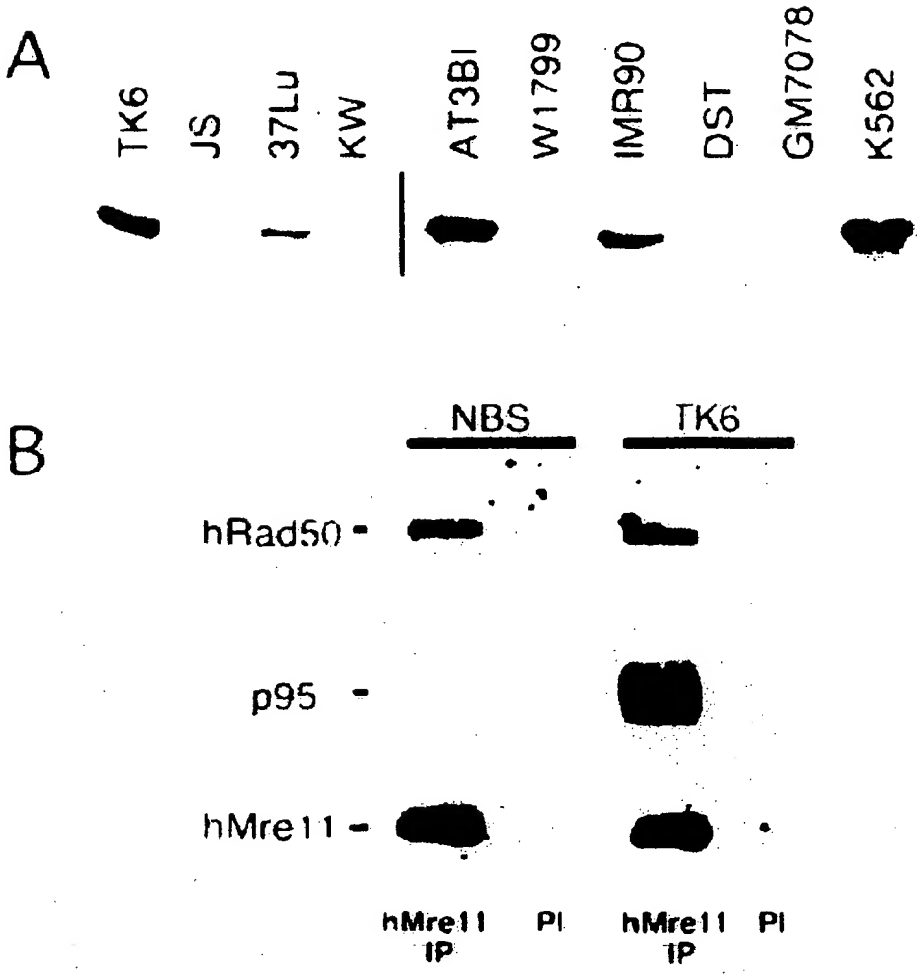
A
TK6
JS
37Lu
KW
AT3BI
W1799
IMR90
DST
GM7078
K562
B
NBS
TK6
hRad50
p95
hMre11
hMre11 IP
PI
hMre11 IP
PI

FIG. 10

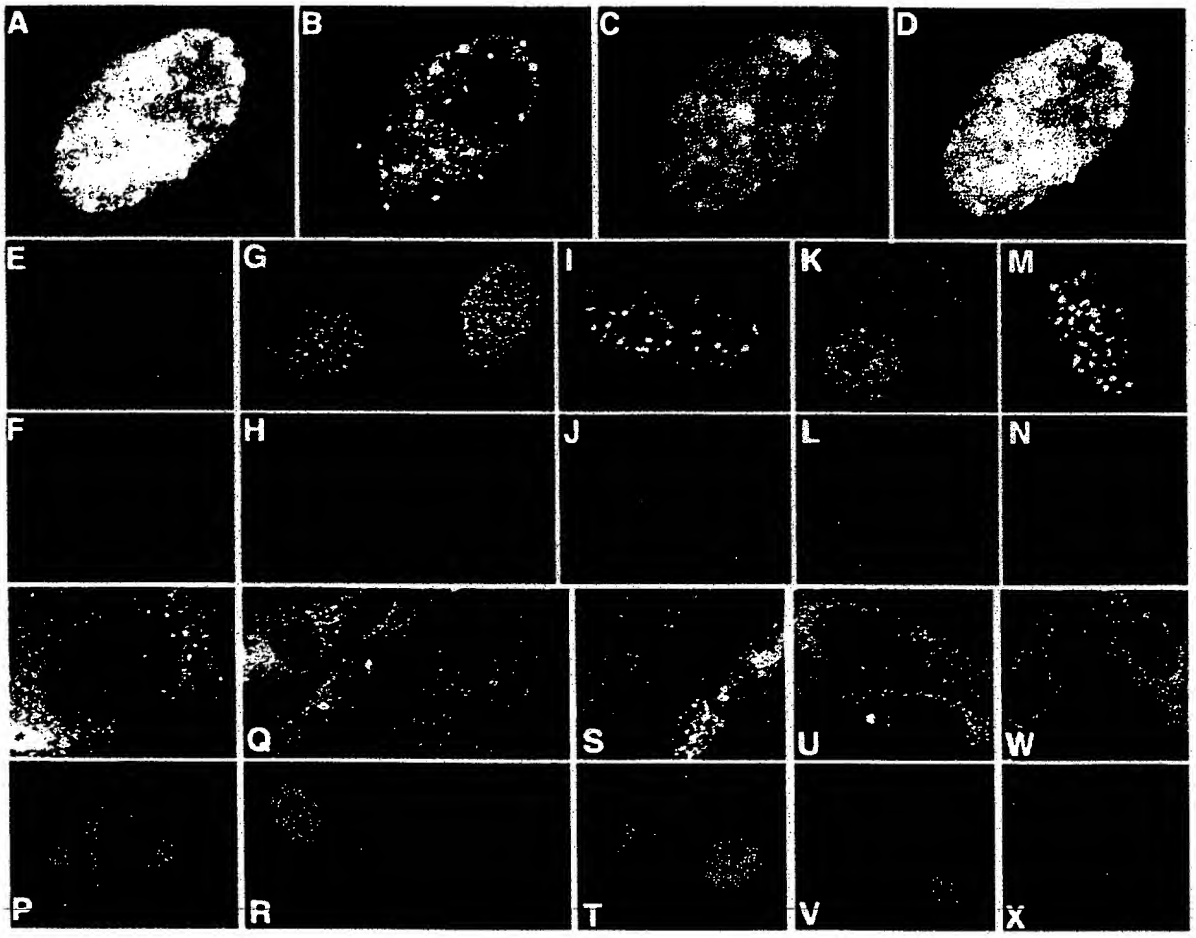

FIG. 11

Amino Acid	Codon
Phe	UUU, UUC
Ser	UCU, UCC, UCA, UCG, AGU, AGC
Tyr	UAU, UAC
Cys	UGU, UGC
Leu	UUA, UUG, CUU, CUC, CUA, CUG
Trp	UGG
Pro	CCU, CCC, CCA, CCG
His	CAU, CAC
Arg	CGU, CGC, CGA, CGG, AGA, AGG
Gln	CAA, CAG
Ile	AUU, AUC, AUA
Thr	ACU, ACC, ACA, ACG
Asn	AAU, AAC
Lys	AAA, AAG
Met	AUG
Val	GUU, GUC, GUA, GUG
Ala	GCU, GCC, GCA, GCG
Asp	GAU, GAC
Gly	GGU, GGC, GGA, GGG
Glu	GAA, GAG

FIG. 12

Original Residue	Exemplary Substitutions	Preferred Substitutions
Ala (A)	val; leu; ile	val
Arg (R)	lys; gln; asn	lys
Asn (N)	gln; his; lys; arg	gln
Asp (D)	glu	glu
Cys (C)	ser	ser
Gln (Q)	asn	asn
Glu (E)	asp	asp
Gly (G)	pro	pro
His (H)	asn; gln; lys; arg	arg
Ile (I)	leu; val; met; ala; phe norleucine	leu
Leu (L)	norleucine; ile; val; met; ala; phe	ile
Lys (K)	arg; gln; asn	arg
Met (M)	leu; phe; ile	leu
Phe (F)	leu; val; ile; ala	leu
Pro (P)	gly	gly
Ser (S)	thr	thr
Thr (T)	ser	ser
Trp (W)	tyr	tyr
Tyr (Y)	trp; phe; thr; ser	phe
Val (V)	ile; leu; met; phe; ala; norleucine	leu

FIG. 13

ttcggcacgaggcgcggttgcacgtcggccccagccctgaggagccggaccgatgtggaaactgctgcccgccgcgggcc
cggcaggaggagaaccatacagacttttgactggcgttgagtacgttgttggaaggaaaaactgtgccattctaattgaa
aatgatcagtcgatcagccgaaatcatgctgtgttaactgctaacttttctgtaaccaacctgagtcaaacagatgaaat
ccctgtattgacattaaaagataattctaagtatggtacctttgttaatgaggaaaaaatgcagaatggcttttcccgaa
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caaaaccagagttagaaattgatgtgaaagttcaaaaacaggaggaagatgtcaatgttagaaaaaggccaaggatggat
atagaaacaaatgacactttcagtgatgaagcagtaccagaaagtagcaaaatatctcaagaaaatgaaattgggaagaa
acgtgaactcaaggaagactcactatggtcagctaaagaaatatctaacaatgacaaacttcaggatgatagtgagatgc
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gatgattatggtcaactaaaaaatttcaagaaattcaaaaaggtcacatatcctggagcaggaaaacttccacacatcat
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aggattttaaaaagaagccatggaaaaacttcctagtaagcatctacttcaggccaacaaggttatatgaatatatagtg
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gct

FIG. 14

MWKLLPAAGPAGGEPYRLLTGVEYVVGRKNCAILIENDQSISRNHAVLTANFSVTNLSQTDEIPVLTLKDNSKYGTFVNE
EKMQNGFSRTLKSGDGITFGVFGSKFRIEYEPLVACSSCLDVSGKTALNQAILQLGGFTVNNWTEECTHLVMVSVKVTIK
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NYCDPQGHPSTGLKTTTPGPSLSQGVSVDEKLMPSAPVNTTTYVADTESEQADTWDLSERPKEIKVSKMEQKFRMLSQDA
PTVKESCKTSSNNNSMVSNTLAKMRIPNYQLSPTKLPSINKSKDRASQQQQTNSIRNYFQPSTKKRERDEENQEMSSCKS
ARIETSCSLLEQTQPATPSLWKNKEQHLSENEPVDTNSDNNLFTDTDLKSIVKNSASKSHAAEKLRSNKKREMDDVAIED
EVLEQLFKDTKPELEIDVKVQKQEEDVNVRKRPRMDIETNDTFSDEAVPESSKISQENEIGKKRELKEDSLWSAKEISNN
DKLQDDSEMLPKKLLLTEFRSLVIKNSTSRNPSGINDDYGQLKNFKKFKKVTYPGAGKLPHIIGGSDLIAHHARKNTELE
EWLRQEMEVQNQHAKEESLADDLFRYNPYLKRRR.

FIG. 15